Zeji Yi

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EDUCATION

School of Aerospace, Tsinghua University (THU), Beijing, China Aug 2020 - Now

- Master of Aerospace Engineering **GPA:** 3.97/4.00

Tsien Excellence in Education Program, Tsinghua University (THU), Beijing, China Aug 2016 - June 2020

- Bachelor of Engineering Mechanics(Graduate with honor) **GPA:** 3.62/4.00
- **Core Courses:** Applied Stochastic Processes(4.0), Matrix Analysis and Applications(4.0), Probabilistic Graphical Models(4.0), Theory and Methods for Statistical Inference(4.0), Finite Element Method(4.0), Convex Optimization(4.0), Quantum Mechanics(4.0), Advanced Machine Learning(4.0)

PUBLICATIONS

- **Zeji Yi**, Zhefeng Cao, Evangelos Theodorou, and Yongxin Chen. "Nonlinear Covariance Control via Differential Dynamic Programming" *American Control Conference 2020 (Citations:16)*
- **Zeji Yi**, Yunyue Wei, Hongda Li, Yanan Sui. "High-dimensional Optimistic Safe Optimization with Projection to Distance-preserving, Quasi-physical Spaces", ICML 2022 ReALML Workshop
- **Zeji Yi**, Yunyue wei, Cloris Cheng, Kaibo He. "Improving sample efficiency of high dimensional bayesian optimization with MCMC on approximated posterior ratio" Submitted to ICML2023
- Jun Hong Lim, **Zeji Yi**, Kaibo He, Chen Hou, Yanan Sui "A Remote Adaptive Upper-Limb Training Framework With Collaborative Robot" Submitted to ICRA2023

RESEARCH EXPERIENCE

Adversarial learning of control parameters| Summer 2022 - Now

Advisor: ChuChu Fan, Assistant Professor at Department of Aeronautics and Astronautics, MIT

- Generating rare/unsafe cases with one or two order larger probability compared with the original environment
- Constructed a network based distribution for control parameters with reparameterization
- Optimized the control parameters based on interpolated density calculated from Liouville equation

High-Dim Bayesian Optimization with MCMC, Beijing, China| Spring - Fall 2022

Advisor: Yanan Sui, Associate Professor at School of Aerospace, THU

- Significantly improved the efficiency of Bayesian optimization on high dimensional space on synthetic functions and RL benchmarks compared to current SOTA algorithm
- Elaborated an MCMC-based candidate selecting method to reduce the computation cost
- Naturally provided paralleled solution for batched Bayesian optimization
- Gave Theoretical regret bound of the algorithm and guarantee the convergence

Coactive learning for dueling bandits, Beijing, China| Summer 2022 - Now

Advisor: Yanan Sui, Associate Professor at School of Aerospace, THU, and Yisong Yue, Professor of Computing and Mathematical Sciences at CalTech

- Proposed a new exact regret bound to replace the original asymptotic analysis of convergence
- Expanded the original coactive learning framework with gradient information for better interaction with human
- Integrated Kalman Filter and Langevin dynamics to sampling problem on Gaussian Process

Machine Learning assisted Spinal Cord Stimulation, Beijing, China | Fall 2021 - Spring 2022

Advisor: Yanan Sui, Associate Professor at School of Aerospace, THU

- Proposed and designed a data-driven System for Spinal Cord Stimulation (Data collecting, Pre-processing)
- Optimized Stimulation Parameter with Safety Bayesian Optimization under different constraints

- Constructed Pre-trained model and Auto-encoders to learn sufficient low-dimensional representation for high-dimensional hybrid inputs with regularization term and likelihood function
- Theoretical analysis of Bayesian optimization's convergence in latent space

Covariance Steering and Differential-Dynamic-Programming, Atlanta, GA, US July 2020 - December 2020

Advisor: Yongxin Chen, Assistant Professor at School of Aerospace Engineering, GaTech

- Proposed a covariance steering method for nonlinear stochastic system
- Solved optimization problem with hard terminal constraint in primal dual algorithm
- Designed the optimal control policy with open-loop and closed-loop control by differential dynamic programming method designed for stochastic dynamic systems
- Developed differential-dynamic programming in belief space, eliminated the uncertainty in propagation and gave a more transparent explanation for the system

Grasping Objects with Robot-arm Carried by Quadrotors, Beijing, China | Project Leader

Advisor: Geng Lu, Assistant Professor at School of Control Science, THU Aug 2017 - Spring 2020

- Built a dynamical model for the highly coupled arm-quad system with multi rigid body dynamics and gained the forward and inverse dynamics solution
- Motion Planning considering the coupling effect by the functional minimum snap method
- Fused the robot arm and quadrotor's controller with the dynamics solution and eliminated the disturbance of quadrotor caused by the robot arm by the feedforward control
- Object detection with RGBD camera and located the quadrotor with indoor location system

Interactive Scenario in Autonomous Vehicle, Berkeley, CA, US | Research Assistant July 2018- Sep 2018

Advisor: Masayoshi Tomizuka, Professor at School of Mechnical Engineering, UCB

- Independently constructed a sequential strategy capable of handling multi interactive agents under information symmetric and asymmetric conditions based on Monte-Carlo method
- Independently realized and optimized a multi-layer inference algorithm in interactive motion planning using A* search and provided a more efficiency heuristic cost

Building and Controlling Quadruped Robot, Beijing, China | Research Assistant Aug 2017 - Aug 2018

Advisor: Ou Ma, Professor at School of Aerospace, THU

- Designed and optimized the configuration of the robot's legs, lowered the maximum torque during walking by 20% and expanded the workspace of each leg by 30%
- Determined the motion of the legs to achieve the step by forcing periodic swinging sinusoidal centroid orbit while maintaining the robot's stability

TEACHING ASSITANTS AND MENTORING

- TA: Human Factors & Artificial Intelligence, 2021 Fall
- TA: Open Research for Innovative Challenges 2021-2022
- Mentoring an undergraduate: Cloris Cheng from Caltech SURF Program 2022 Summer

HONORS AND AWARDS

- Graduate with Honor: Tsien Excellence in Education Program, 2020
- Tsinghua Academic Excellence Scholarship (Top 10%), 2018,2019
- Second Class Prize of China Undergraduate Mathematical Contest in Modeling, 2017
- First Class Prize of Chinese Physics Olympiad (CPHO) (Top 2%), 2016
- Tsinghua-Xuetang Scholar for Excellent Foster Innovative Talent 2016-2018

SKILLS

Computer: Python, Matlab/Simulink, SolidWorks, C++, LINUX, ROS, COMSOL, ABAQUS